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EXAMINER	
ARCIERO, ADAM A	

ART UNIT	PAPER NUMBER
1795	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/567,347	KATO ET AL.
	Examiner	Art Unit
	ADAM A. ARCIERO	1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 February 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *06 February 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *01/09/2008*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Summary

1. This is an initial office action based of the application for an Alkaline Battery filed on 02/06/2006.

2. Claims 1-6 are currently pending and have been fully considered.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As to Claim 1, the limitation of "the ratio of H/W of a height H of said peak P to said half-width W is 10,000 or more" is indefinite because the ratio of H/W is arbitrary for the following reasons:

Claims 1-6 are drawn to an alkaline battery comprising an electrode having a positive active material, wherein said active material comprises spherical nickel oxyhydroxide with a ratio H/W of 10,000 or more. In the specification, H is counts per second (cps). It is unclear to the Examiner how the nickel oxyhydroxide can be characterized by the H/W ratio when the height (H) of the peak depends on various variables. Also the width (W) depends on the method for preparing the sample which is also unknown. For example, if signal averaging was used, a higher intensity would be measured. Also if a different detector or

different units of measurement are used, the value for H will differ. A highly sensitive detector would give higher peak intensities (and consequently more counts per second) than a detector that is not as sensitive. The variables affecting peak intensities and peak width in powder X-ray diffraction patterns are discussed in B.D. Cullity in Elements of X-Ray Diffraction, Second Edition, Addison-Wesley Publishing Company, Inc., Massachusetts, 1978, pages 29, 88, 101-104, 110, 135, 136, 139-143, 151, 178, 194, 195, 199-213, and 398-403 (hereinafter referred to as "Cullity").

X-ray spectroscopy is performed on samples so that the crystal structure of the sample can be analyzed by measuring the angles of radiation scattering (θ) and by knowing the wavelength of the radiation used which would give the spacing d of various planes in a crystlan (pg. 88, pg. 178, pg. 139-143 of Cullity). Since absolute intensities of the peaks in an X-ray diffraction pattern and unit for the intensity can be expressed in arbitrary units, or in units used by the detectors (pgs. 110, 139 of Cullity). The intensity of the peaks depends on several factors such as intensity of the incident beam (pg. 29 of Cullity), temperature (pg. 135-136 of Cullity), the irradiated volume of the specimen (see page 139 of Cullity), the orientation of the crystal grains (see page 140 of Cullity), the method of preparing the sample (see pages 194-195 of Cullity), and the gain of the detector used (see pages 204-209 of Cullity, especially Figure 7-15, Figure 7-16). Therefore, the cps value obtained depends on the gain of the amplifier used in the measurement. The width of the diffraction peaks depends on the particle size of the crystals (see

pages 101-102 of Cullity) and would therefore depend on how the sample was prepared for X-ray diffraction.

The intensity of X-ray diffraction patterns is conventionally regarded as being arbitrary as shown in the Figures in USP 5,599,775.

Further examples of relative intensities in the X-ray diffraction pattern used in the art are:

US Patent No. 6,299,760 B1 which discloses the use of relative intensity as the ordinate in an X-ray diffraction spectrum (col. 2, lines 23-25);

US Patent No. 5,720,932 which discloses X-ray diffraction patterns where the intensity scale is optional and the reference relies on the integrated intensity ratio (which is the same as relative integrated intensities) between two diffraction lines in the data analysis of the X-ray diffraction patterns (col. 5, lines 19-57 and Figures 1-3C);

and US Pat. 5,702,844 which discloses nickel hydroxide having an intensity ratio (which is the relative intensity) of the [103] line to the [200] line in the X-ray diffraction diagram of 1.05 ± 0.10 (see abstract).

Furthermore, the ratio H/W in the present claims is indefinite because the detailed experimental conditions for obtaining the X-ray diffraction pattern are not given in the present specification. Applicants' disclosure of the use of an X-ray diffractometer "RINT 1400" manufactured by Rigaku Corporation as the power

and current of the radiation source does not provide the critical information needed for determining the ratio H/W of a height H of a peak P to the half-width W as being 10,000 or more. Specifically, examples of parameters that affect the peak intensities of the X-ray diffraction pattern such as the incident intensity of the X-ray radiation which is affected by the slit width of the collimator in the X-ray diffractometer (pp-188-192), the scan rate for obtaining the X-ray pattern, and the type of detector and amplification circuitry of the detector used to collect the scattered radiation (the intensity of the signal as a function of 2θ) from the sample are not given in applicants' specification. Cullity also discloses that line intensities also depend on the apparatus (Cullity, pg. 401).

Many different types of detectors exist to collector X-ray photons. For example, proportional, Geiger, scintillation, and semiconductor detectors can be used to measure the signal (page 199 of Cullity). The use of different types of detectors would give different peak intensities for identical experimental conditions and sample preparation since different detectors have different quantum efficiencies for collecting photons, and different units to express the intensity (pp. 200-203). Using the same detector would also give different peak intensities if the amplification (gain) of the detector is varied (pp. 204-213 of Cullity). The radiation collected by a detector must calibrated against a standard in order to calculate the absolute intensity of the peak. The absolute intensity of the peak is meaningless unless the incident intensity of the beam is given since the intensity of the peak is directly proportional to the intensity of the incident beam.

Although applicants <u>have not determined the absolute intensities</u> of the peaks (which is independent of the type of detectors used, and the electronic circuitry of the detector such as amplifiers), absolute intensities are not conventionally used in the art since intensities detected vary with experimental conditions such as the intensity of the incident beam (Cullity p. 29). The absolute intensity of the peaks for a given incident X-ray diffraction beam is not conventionally measured in the art since the intensity of the incident X-ray beam on the sample is not standardized in the field of powdered X-ray diffraction spectrometry in contrast to the field of NMR (nuclear magnetic resonance) spectroscopy where the position of the signals of the chemical shift of the sample have been calibrated against a standard such as TMS (tetramethylsilane) as a reference for the chemical shifts. Instead, the relative intensity of peaks (intensity ratios) are used in the X-ray diffraction art as the standard for comparison of different samples since the relative intensity does not depend on the incident intensity of the X-ray beam (the ratio cancels out the incident intensity factor and is therefore <u>independent</u> of the incident intensity).

As further evidenced by Cullity, the standard practice in X-ray powder diffraction spectrometry is characterizing the powder pattern by the spacing d of the lattice planes (which is independent of the wavelength of the radiation used) and a set of relative line intensities of the same wavelength (page 398-403) in order to provide a fingerprint for known substances or for identifying unknown substances. A standard system in the art has been devised to built a collection of known X-ray

diffraction patterns listing the spacing d of the lattice planes and a set of relative line intensities that are normalized to the strongest line in the pattern in the X-ray diffraction pattern (see pages 398-400).

It is not conventional in the art to measure the peak intensity of a X-ray diffraction pattern since this value varies with the incident intensity of the X-ray beam, the type of detector used, and the gain of the electronic circuitry used to collector the signal as discussed above. For these reasons, the peak intensity of a diffraction line cannot be used alone and must be used in comparison with the peak intensity of another diffraction line in the X-ray diffraction pattern in order to divide out (cancel out) the incident intensity factor of the X-ray beam. It has been standard practice in the X-ray diffraction spectrometry to use relative peak intensity ratios where the units on the ordinate axis can be arbitrary (see page 194, Figure 7-5).

Although the JP 10-270042 A reference discloses a H/W ratio with certain values, this ratio is arbitrarily defined since H would depend on the gain (amplification) of the detector used and experimental parameters that affect intensities as discussed above. The reference does not disclose calibrating the detector to a standard such that the incident radiation on the sample can be calculated to give the absolute intensity of the peaks in the reference. The peak intensities are given as CPS (counts per second) which is not the unit for absolute intensity. Furthermore, the applicants of the represent application does not disclose how the intensities are obtained.

The ratio H/W where H is the peak intensity of a diffraction line and W is the width of the diffraction line at half width maximum does not appear to be recognized in peer reviewed scientific literature and standard textbooks on X-ray crystallography as a measure of crystallinity of a sample. Cullity discloses that the W value (the width at half-maximum of peak intensity of a line) can be used in Scherrer formula to estimate the particle size (page 101-102).Furthermore, US 5,702,844 discloses that the value W is a measure of crystallite size. Therein, US 5,702,844 reference also discloses that the crystallite size of the nickel hydroxide is normally calculated from the most intense line in the spectrum such as the (101) line and sometimes the less intense line (001) can be used (col. 3, lines 1-11). The crystalline size is obtained from the broadening of the lines (the line width at half-maximum of the peak, the W value) in the X-ray diffraction pattern (col. 2, lines 64-66).

A kind of crystal imperfection known as mosaic structure increases the integrated intensity of the reflected beam <u>relative</u> to that theoretically calculated for an ideally perfect crystal (see pages 103-104 of Cullity). Again, the relative ratio of intensities, not the absolute intensities, are used to determine a characteristic of the crystal which is independent of the incident intensity of the X-ray beam used. Applicants have not calculated the integrated intensity of the reflected beam relative to the theoretical value to measure the degree of crystallinity of the sample.

Thus, in view of the above discussion that the intensity of the peak and the width of the peak can vary depending on the experimental conditions and the technique used to prepare the sample, the value of the ratio of H/W is indefinite. Even if the half-width W can be controlled in sample preparation, applicants claim the ratio H/W as a dimensionless number as being 10,000 or more in claim 1. However, the unit for W is in degrees and the unit for H can be arbitrary since applicants have not given a unit for H in claim 1. For example, if the peak intensity H was measured in terms of volts using a semiconductor detector, then 1 volt can be 1000 millivolts which could also be 1,000,000 microvolts and the ratio H/W can vary from several orders of magnitude depending on which unit of measurement is used to express the peak intensity and what gain factor (amplification of the signal) is used in detecting the radiation. If a peak signal has an intensity of 9000 CPS (counts per second) as disclosed in JP 10-270042, decreasing the gain of the detector by a factor of 9 would give an intensity of 1000 CPS.

Claims depending from claims rejected under 35 USC 112, second paragraph are also rejected for the same.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-2 are rejected under 35 U.S.C. 103(a) as being unpatentable over SEI et al. (JP 10-270042 A) in view of DANSUI et al. (US Patent No. 6,074,785).

As to Claims 1 and 2, SEI et al. discloses an alkaline battery comprising a positive electrode active material of nickel hydroxide containing particles (paragraph [0024]), a negative electrode having an active material (paragraph [0025]), and an alkaline electrolyte (paragraph [0025]). The nickel hydroxide containing particles have a 0.65 ° half width or less in the (001) plane in the X-ray diffraction pattern and the ratio of the peak intensity to the half width (H/W) is more than 10,000 (Abstract, there is a typographical error in the JPO English abstract for the ratio that is cited as 1000; see paragraph [0014] of machine translation and Table 1 of the reference). Specific values of 0.60° are disclosed in Table 1 for the half width W. The nickel hydroxide containing particles can also have cobalt dissolved therein (Abstract). SEI et al. does not expressly disclose the mean valency of nickel as being 2.95 or more.

However, DANSUI et al. discloses a nickel/metal hydride storage battery (alkaline battery) comprising a positive electrode made of an active material, a negative electrode comprising a hydrogen-absorbing alloy (negative active material), an alkali electrolyte and a separator (col. 4, lines 4-9). The positive electrode active material comprises spherical particles of nickel oxyhydroxide (example 1, col. 5, lines 49-55) comprising a beta-type-NiOOH structure having a diffraction peak of 2θ on a (001) plane at an angle of 15°-19° (col. 4, lines 14-19).

The mean valence of nickel at a charged state is as high as 3.5 (col. 4, lines 23-24).

At the time of the invention, a person having ordinary skill in the art would have found it obvious to modify the positive active material of SEI et al. so that the nickel has a mean valence of nearly 3.5, because the energy density of the active material will increase and characteristics of the positive electrode can be improved, as taught by DANSUI et al. (col. 4, lines 19-27).

7. Claims 3-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over SEI et al. (JP 10-270042 A) in view of DANSUI et al. (US Patent No. 6,074,785) as applied to claim 1 above, and further in view of HIDEO et al. (EP 0 831 542 A1).

As to Claims 3 and 4, the disclosure of SEI et al. in view of DANSUI et al. as discussed above in claims 1 and 2 is incorporated herein. The combination of SEI et al. and DANSUI et al. does not expressly disclose wherein the spherical nickel oxyhydroxide carries a cobalt oxide and the cobalt contained in said cobalt oxide has a mean valence of greater than 3, and wherein said cobalt oxide is in the amount of 0.5-15 parts by weight per 100 parts of weight of said spherical nickel oxyhydroxide.

However, HIDEO et al. teaches a lithium secondary battery comprising a positive electrode which comprises a positive active material. Said active material comprises nickel oxyhydroxide wherein nickel is trivalent (col. 2, lines 29-34) giving a crystal of a beta-type structure. Cobalt is also added when producing the active material in a trivalent state (col. 2, lines 29-34) in an atmosphere consisting

of air (col. 3, lines 30-33) thereby providing cobalt oxide. Therefore the nickel oxyhydroxide carries a cobalt oxide wherein the cobalt contained in said cobalt oxide has a mean valence of 3. Example 1 provided the complex oxyhydroxide of nickel and cobalt as $Ni_{0.85}Co_{0.15}OOH$, so cobalt is provided in an amount of 15 parts by weight per 100 parts of weight of said spherical nickel oxyhydroxide (example 1, col. 4, lines 53-54).

At the time of the invention, a person having ordinary skill in the art would have found it obvious to modify the active material of SEI et al. and DANSUI et al. with cobalt in an atmosphere consisting of air in an amount of 15 parts by weight of the total composition of nickel oxyhydroxide so that a large specific capacity can be obtained, as suggested by HIDEO et al. (col. 3, lines 16-19). Also, according to MPEP 2144.05 [R-5], "In the case where claimed ranges 'overlap or lie inside ranges disclosed by the prior art' a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976)."

Furthermore, according to MPEP 2144.05 [R-5], "Generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. 'Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.' *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955)." Therefore the ranges disclosed by HIDEO et al. for the amount of cobalt would be obvious over the claimed ranges of the instant application.

As to Claims 5 and 6, the combination of SEI et al. and DANSUI et al. does not expressly disclose wherein the positive electrode further contains at least one additive selected from the group consisting of zinc oxides, calcium oxides, yttrium oxides and titanium oxides.

However, HIDEO et al. teaches that the nickel oxyhydroxide can contain a transition metal such as zinc (Zn) (Abstract) wherein the transition metal content is suitably selected to be in a range of 0.05-0.5 (col. 4, lines 30-31).

At the time of the invention, a person having ordinary skill in the art would have found it obvious to modify the active material of SEI et al. and DANSUI et al. with zinc in an amount of 15 parts by weight of the total composition of nickel oxyhydroxide so that a large specific capacity can be obtained, as suggested by HIDEO et al. (col. 3, lines 16-19). Also, according to MPEP 2144.05 [R-5], "In the case where claimed ranges 'overlap or lie inside ranges disclosed by the prior art' a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976)." Furthermore, according to MPEP 2144.05 [R-5], "Generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. 'Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.' *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955)." Therefore the

ranges disclosed by HIDEO et al. for the amount of cobalt would be obvious over the claimed ranges of the instant application.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ADAM A. ARCIERO whose telephone number is (571)270-5116. The examiner can normally be reached on Monday to Friday 8am to 5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Susy Tsang-Foster can be reached on 571-272-1293. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AA
/Susy Tsang-Foster/

Supervisory Patent Examiner, Art Unit 1795